UNITED STATES PATENT AND TRADEMARK OFFICE

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>14 September 2007</u>.
2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-28</u> is/are pending in the application.
    4a) Of the above claim(s) <u>1-14</u> is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) <u>15-19, 22 and 25-28</u> is/are rejected.
7)☒ Claim(s) <u>20, 21, 23 and 24</u> is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☒ The drawing(s) filed on <u>14 September 2007</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.
    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
    a)☒ All   b)☐ Some * c)☐ None of:
      1.☒ Certified copies of the priority documents have been received.
      2.☐ Certified copies of the priority documents have been received in Application No. _____.
      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)
1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>04/26/2006</u>.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Priority

1.   Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which

papers have been placed of record in the file.

Information Disclosure Statement

2.   The references listed in the Information Disclosure Statement filed on March 26,

2006 have been considered by the examiner (see attached PTO-1449 form or

PT/SB/08A and 08B forms).

Claim Rejections - 35 USC § 103

3.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

4.   **Claims 15 and 25-27 are rejected under 35 U.S.C. 103(a) as being**

unpatentable over Adams et al. (hereinafter "Adams") [US 2003/0076118 A1] in

view of Tews et al. (hereinafter "Tews") [5397993].

Regarding claim 15, Adams teaches a method for determining the humidity of a

dielectric material in a resonator (sensor assembly) filled with the material ("plant

material" – para [0023]), the resonator including a sender (frequency generating circuit)

and a receiver (signal processing circuit) (para [0037]), the method comprising:

emitting a signal by the sender ("...applies excitation signal to sensor assembly" -

para [0042]);

sweeping a resonance curve of the filled resonator ("frequency

analysis...generating power spectrum..." - para [0052]);

measuring appropriate signal strength values of the receiver signal at respective

different frequencies (para [0053], lines 10-11);

Adams does not specifically disclose determining a resonant frequency and a

bandwidth for the filled resonator.

However, Tews teaches determining moisture content of a test material by

determining a resonant frequency (resonance frequency $f(0)$) and a bandwidth

(resonance half-maximum value $b(0)$) for the filled resonator ("material in the resonator"

– col 3, line 26) from points corresponding to the signal strength values of the receiver

signal at the respective different frequencies (variable frequencies) measured (col 1,

lines 8-20).

calculating at least one of humidity (moisture content, ψ) or density (density of

material, ρ) of the material by solving a second system of equations (equations 1, 2, &

3, col 8) comprising the resonant frequencies and respective bandwidths of the empty (

empty line width $b(LO)$ & $f(LO)$) and of the filled resonator and known calibration

coefficients ("correction quantities" – col 9, lines 50-58) of the resonator (col 8, lines 39

– col 9, line 62).

At the time of the invention, it would have been obvious to one of ordinary skill in

the art to determine the humidity and density of a material by using the measurement

and calculation process as taught by Tews when determining the humidity characteristic

of a dielectric material in a resonator disclosed by Adams to improve the production

quality in a process plant (col 1, lines 22-32).

Regarding claim 25, Adams does not specifically disclose the second system of

equations describes the correlation of humidity and density.

However, Tews teaches determine the humidity and density of a material by

using the calculation process wherein the second system of equations describes

(equations 1, 2, & 3, col 8), as at least an approximation, the correlation of humidity

(moisture content, ψ) and density (density of material, ρ) with the variation of resonant

frequency (f(L)-f(0)) and bandwidth (b(0)-b(L)), in a predefined range of humidity and

density (frequency/width plot) (fig 7a, col 8, lines 39 – col 9, line 62).

At the time of the invention, it would have been obvious to one of ordinary skill in

the art to determine the humidity and density of a material by using the calculation

process as taught by Tews when determining the humidity characteristic of a dielectric

material in a resonator disclosed by Adams to improve the production quality in a

process plant (col 1, lines 22-32).

Regarding claim 26, Adams does not specifically disclose the second system of

equations is non-linear.

However, Tews teaches determine the humidity and density of a material by using the calculation process wherein the second system of equations (equations 1, 2, & 3, col 8) is non-linear ("nonlinear function of ρ" - col 8, lines 47-49).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to determine the humidity and density of a material by using the calculation process as taught by Tews when determining the humidity characteristic of a dielectric material in a resonator disclosed by Adams to improve the production quality in a process plant (col 1, lines 22-32).

Regarding claim 27, Adams does not specifically disclose the sweeping by the sender is performed up to the microwave area.

However, Tews teaches determine the humidity and density of a material by using the measurement process wherein the sweeping by the sender (microwave generator) is performed up to the microwave area (microwave signal) (col 1, lines 10-13).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to determine the humidity and density of a material by measuring at the microwave level as taught by Tews when determining the humidity characteristic of a dielectric material in a resonator disclosed by Adams to improve the production quality in a process plant (col 1, lines 22-32).

5.   **Claims 16 and 25-27 are rejected under 35 U.S.C. 103(a) as being**

unpatentable over Adams in view of Tews, as applied to claim 15 above, and

further in view of Rawlins et al. (hereinafter "Rawlins") [NPL, "Basic AC Circuits:

Second Edition"].

Regarding claim 16, Adams in view of Tews, does not specifically disclose

determining the bandwidth of the filled resonator by using the quantities resonant

frequency, resonator quality and resonance maximum or the cut-off frequencies.

However, Rawlins teaches determining bandwidth is known to have the

relationship, $BW = f_r/Q$, where f_r = resonant frequency and Q = resonator quality; and

further relationship, $BW = 2(f_{lower} - f_r)$, where f_{lower} can be represented as upper and

lower frequencies also known as cutoff frequencies (equation *14-27*, page 464).

At the time of the invention, it would have been obvious to one of ordinary skill in

the art to determine the bandwidth and resonant frequency by using the equations as

taught by Tews when determining the bandwidth and resonant frequency of the filled

resonator disclosed by Adams in view of Tews because it is well known in the art that

one can calculate bandwidth from the resonant frequency, resonator quality, or cut-off

frequency.

Regarding claim 25, Adams does not specifically disclose the second system of

equations describes the correlation of humidity and density.

However, Tews teaches determine the humidity and density of a material by

using the calculation process wherein the second system of equations describes

(equations 1, 2, & 3, col 8), as at least an approximation, the correlation of humidity

(moisture content, ψ) and density (density of material, ρ) with the variation of resonant

frequency (f(L)-f(0)) and bandwidth (b(0)-b(L)), in a predefined range of humidity and

density (frequency/width plot) (fig 7a, col 8, lines 39 – col 9, line 62).

At the time of the invention, it would have been obvious to one of ordinary skill in

the art to determine the humidity and density of a material by using the calculation

process as taught by Tews when determining the humidity characteristic of a dielectric

material in a resonator disclosed by Adams to improve the production quality in a

process plant (col 1, lines 22-32).

Regarding claim 26, Adams does not specifically disclose the second system of

equations is non-linear.

However, Tews teaches determine the humidity and density of a material by

using the calculation process wherein the second system of equations (equations 1, 2,

& 3, col 8) is non-linear ("nonlinear function of ρ" - col 8, lines 47-49).

At the time of the invention, it would have been obvious to one of ordinary skill in

the art to determine the humidity and density of a material by using the calculation

process as taught by Tews when determining the humidity characteristic of a dielectric

material in a resonator disclosed by Adams to improve the production quality in a

process plant (col 1, lines 22-32).

Regarding claim 27, Adams does not specifically disclose the sweeping by the sender is performed up to the microwave area.

However, Tews teaches determine the humidity and density of a material by using the measurement process wherein the sweeping by the sender (microwave generator) is performed up to the microwave area (microwave signal) (col 1, lines 10-13).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to determine the humidity and density of a material by measuring at the microwave level as taught by Tews when determining the humidity characteristic of a dielectric material in a resonator disclosed by Adams to improve the production quality in a process plant (col 1, lines 22-32).

6.   **Claims 17, 18 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adams in view of Tews, as applied to claim 15 above, and further in view of Cammack [US 6653799 B2].**

Regarding claim 17, Adams in view of Tews does not specifically disclose while performing a frequency sweep, a lower threshold signal strength value is calculated.

However, Cammack teaches performing a frequency sweep to maintain power frequency components wherein a lower threshold signal strength value is calculated ("amplitude level...7.8dB lower than amplitude...designated as threshold" – col 12, lines 50-51) and a second sweeping pass with smaller step sizes ("higher sweep rate at lower frequencies than at higher frequencies," col 13, lines 50-55) is performed in a

range in which the signal strength values are higher than the threshold signal strength

value (maintains the component of power frequency) ("frequency sweeps accurately

reproduce the desired power frequency components," figures 17&18, col 13, lines 4-26).

At the time of the invention, it would have been obvious to one of ordinary skill in

the art to determine the peak frequency by performing the tuning method as taught by

Cammack when performing a frequency sweep to determine the resonant frequency

disclosed by Adams in view of Tews to reduce acoustic resonances and arc instabilities

(col 2, lines 13-14).

Regarding claim 18, Adams in view of Tews does not specifically disclose

sweeping the resonance curve is performed in equally spaced steps.

However, Cammack teaches sweeping the resonance curve is performed in

equally spaced steps ("frequency (kHz)...200...250...300," fig 18).

At the time of the invention, it would have been obvious to one of ordinary skill in

the art to sweep in equally spaced steps as taught by Cammack when performing a

frequency sweep to determine the resonant frequency disclosed by Adams in view of

Tews to reduce acoustic resonances and arc instabilities (col 2, lines 13-14).

Regarding claim 28, Adams in view of Tews does not specifically disclose

voltage values of the receiver are used for measuring the receiver signal.

However, Cammack teaches a controller including a microprocessor configured

such that voltage values and current values of the receiver (controller) are used for

measuring the receiver signal (voltage and current measurement signals) (col 5, lines 55-58).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use measured voltage and current values as taught by Cammack when measuring the receiving signal to determine the humidity characteristic of a dielectric material in a resonator disclosed by Adams in view of Tews to reduce acoustic resonances and arc instabilities (col 2, lines 13-14).

7.   **Claims 17, 18 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adams in view of Tews, further in view of Rawlins, as applied to claim 16 above, and further in view of Cammack [US 6653799 B2].**

Regarding claim 17, Adams in view of Tews and further in view of Rawlins does not specifically disclose while performing a frequency sweep, a lower threshold signal strength value is calculated.

However, Cammack teaches performing a frequency sweep to maintain power frequency components wherein a lower threshold signal strength value is calculated ("amplitude level...7.8dB lower than amplitude...designated as threshold" – col 12, lines 50-51) and a second sweeping pass with smaller step sizes ("higher sweep rate at lower frequencies than at higher frequencies," col 13, lines 50-55) is performed in a range in which the signal strength values are higher than the threshold signal strength value (maintains the component of power frequency) ("frequency sweeps accurately reproduce the desired power frequency components," figures 17&18, col 13, lines 4-26).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to determine the peak frequency by performing the tuning method as taught by Cammack when performing a frequency sweep to determine the resonant frequency disclosed by Adams in view of Tews and further in view of Rawlins to reduce acoustic resonances and arc instabilities (col 2, lines 13-14).

Regarding claim 18, Adams in view of Tews and further in view of Rawlins does not specifically disclose sweeping the resonance curve is performed in equally spaced steps.

However, Cammack teaches sweeping the resonance curve is performed in equally spaced steps ("frequency (kHz)...200...250...300," fig 18).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to sweep in equally spaced steps as taught by Cammack when performing a frequency sweep to determine the resonant frequency disclosed by Adams in view of Tews and further in view of Rawlins to reduce acoustic resonances and arc instabilities (col 2, lines 13-14).

Regarding claim 28, Adams in view of Tews and further in view of Rawlins does not specifically disclose voltage values of the receiver are used for measuring the receiver signal.

However, Cammack teaches a controller including a microprocessor configured such that voltage values and current values of the receiver (controller) are used for

measuring the receiver signal (voltage and current measurement signals) (col 5, lines 55-58).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use measured voltage and current values as taught by Cammack when measuring the receiving signal to determine the humidity characteristic of a dielectric material in a resonator disclosed by Adams in view of Tews and further in view of Rawlins to reduce acoustic resonances and arc instabilities (col 2, lines 13-14).

8.   **Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Adams in view of Tews, as applied to claim 15 above, and further in view of Lukaszek [3732846].**

Regarding claim 19, Adams in view of Tews does not specifically disclose the sender is operated using a constant strength.

However, Lukaszek teaches determining the impedance characteristic of a crystal in the frequency range of a desired harmonic wherein the sender (sweep-frequency generator) is operated using a constant strength (col 3, lines 13-15).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use a constant strength output as taught by Lukaszek when performing a frequency sweep to determine the resonant frequency disclosed by Adams in view of Tews to reduce unwanted modes within a given frequency range (col 2, lines 12-13).

9.   **Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Adams in view of Tews, further in view of Rawlins, as applied to claim 16 above, and further in view of Lukaszek [3732846].**

Regarding claim 19, Adams in view of Tews and further in view of Rawlins does not specifically disclose the sender is operated using a constant strength.

However, Lukaszek teaches determining the impedance characteristic of a crystal in the frequency range of a desired harmonic wherein the sender is operated using a constant strength (col 3, lines 13-15).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use a constant strength output as taught by Lukaszek when performing a frequency sweep to determine the resonant frequency disclosed by Adams in view of Tews and further in view of Rawlins to reduce unwanted modes within a given frequency range (col 2, lines 12-13).

10.   **Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Adams in view of Tews, further in view of Rawlins, as applied to claim 16 above, and further in view of Petillion [US 6347286 B1].**

Regarding claim 22, Adams in view of Tews and further in view of Rawlins does not specifically disclose determining resonant frequency, resonator quality and resonance maximum by at least one of arbitrarily or randomly selecting three of the points and solving a first system of equations to obtain resonant parameters.

However, Petillon teaches determine characteristics of a signal by selecting three of the points (selecting three complex elements) and solving a first system of equations to obtain parameters (parameters Pq(A1, A2, f1, f2,Φ1, Φ2)), the system consisting of three equations of an analytic resonance curve valid for the three points (three complex expressions).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the calculation process of the systems of equations as taught by Petillion when determining resonant frequency, resonator quality and resonance maximum disclosed by Adams in view of Tews and further in view of Rawlins to improve the resolution of the estimation of the frequency of the signal (col 2, lines 6-11).

11.   **Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Adams in view of Tews, further in view of Rawlins, further in view of Petillion, as applied to claim 22 above, and further in view of Teo [6050946].**

Regarding claim 24, Adams in view of Tews, further in view of Rawlins, and further in view of Petillion does not specifically disclose as a condition for the at least one of arbitrarily or randomly selecting the points, the signal value of a particular one of the points to be selected is higher than the highest signal value attenuated by 3 dB.

Teo teaches performing spectral analysis from a received RF signal (col 2, lines 33-35) wherein the signal value of a particular one of the points to be selected is higher than the highest signal value attenuated by 3 dB (selecting frequency bins that fall

within the range between the -3dB low frequency and the -3 dB high frequency) (col 5,

lines 17-22).

At the time of the invention, it would have been obvious to one of ordinary skill in

the art to select points above the 3dB as taught by Teo when selecting values for the

system of equations for determining resonant frequency, resonator quality and

resonance maximum disclosed by Adams in view of Tews, further in view of Rawlins,

and further in view of Petillion to enhance ultrasound imaging quality (col 1, lines 10-15).

Allowable Subject Matter

12.   Claims 20, 21, 23 and 24/23 are objected to as being dependent upon a rejected

base claim, but would be allowable if rewritten in independent form including all of the

limitations of the base claim and any intervening claims.

13.   The following is a statement of reasons for the indication of allowable subject

matter:

Claim 20 recites inter alia, *determining a one of the points having a highest signal*

strength value, and, starting from said one of the points, calculating a threshold value

and determining two proximate points for positive and negative slope sections, the

signal values of said two proximate points lying below and above the threshold value,

respectively and calculating first and second cut-off frequencies therefrom by

respectively interpolating between the two proximate points.

Claim 21 recites inter alia, *the threshold value corresponds to an attenuation of 3 dB in relation to the highest signal strength value.*

Claim 23 recites inter alia, *at least one of arbitrarily or randomly selecting a set of the points for which a number is an integer multiple of three and is at least six, and splitting up the point set into three equally sized groups and for each combination of three points, wherein each point comes from a different one of the groups, solving a first system of equations to obtain resonant parameters, the system consisting of three equations of the analytic resonance curve valid for said three points and for each of the resonant parameters, creating an average of values calculated at said combinations.*

Claim 24/23 recites inter alia, *as a condition for the at least one of arbitrarily or randomly selecting the points, the signal value of a particular one of the points to be selected is higher than the highest signal value attenuated by 3 dB.*

The references of record do not teach or suggest the aforementioned limitation, nor would it be obvious to modify those references to include such limitation.

Conclusion

14.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Assenheim (US Patent Number 5,666,061) discloses an apparatus and method for measurement of moisture concentration in granular materials;

Nishimura et al. (US Patent Number 6,686,870) discloses a radar device for detecting a target with high accuracy by detecting a true peak frequency with a high accuracy;

Mitsuyoshi et al. (US Patent Number 4,611,164) discloses a spectrum analyzer with automatic peak frequency tuning function;

Bruno et al. (US Patent Number 6,226,529) discloses a system, apparatus and method for providing simultaneous data and voice within a single channel of portable telephone;

Boyan et al. (US Patent Number 6,389,365) discloses a method for operating a spectrum analyzer to display a marker of a signal of interest.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RICKY NGON whose telephone number is (571)270-3340. The examiner can normally be reached on 5/4/9.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anh T. Mai can be reached on (571)272-1995. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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